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## Preservation of Cartographic Materials: A Case Study

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Traditionally, preservation of maps has usually involved familiar practices of paper conservation and may have involved simple techniques such as tape removal, mending of small tears, and paper cleaning. Similarly, the process could become more involved with washing, applying a lining, varnish removal, and deacidification; and these processes usually would be performed by professionally trained conservators. Such processes continue today for collections that have completed needs assessment surveys and determine that certain items have artifactual value beyond their information content. In other words, such items meet certain criteria:

- They are deemed important to the institution's archival memory;
- They represent a significant cartographic example of that region's history;
- The item has significant monetary value;
- It is extremely rare and available in very few collections; or is simply unique.

Let us be sure to understand that this process, the actual treatment of the original itself, is the only one that preserves the item and not just its information.

Another process that is often used for embrittled materials is microfilming and, unfortunately, several collections of maps have been "preserved" in this manner. Another variant of this process is microfiche with which we are all too familiar. It is unfortunate because this is simply not a very satisfactory method for reformatting or saving map information. Filming a 6' x 9' map and placing it on a one inch square piece of film has rather disastrous implications for access, viewing (much less research), and for copying. However, in some cases, this is the only format that you can acquire if interested in fire insurance maps, some atlases, and a variety of special collections offered by libraries. Most libraries are familiar with the number of fire insurance maps available on microfilm and I suspect your patrons are as fond of using them as ours are.

But before you think this may be another discussion of these two varieties of preservation let me assure you that it is not. I want to discuss two very different approaches to the preservation of cartographic materials that are ongoing in the Harvard Map Collection.

The first involved the creation of a prototype collection of maps that could be used to evaluate the use of Kodak Photo CD technology. For a variety of reasons we chose the geographical area of the Middle East and specifically the country of Israel. While most libraries do not like to admit their mistakes, I will admit to you that this project failed miserably on almost every variable that we attempted to evaluate. The major factor was that too many of the maps resembled my microfilm analogy of the 6' x 9' foot map being reduced to one inch of film. However, in this case, we were taking a 2' x 4' map—think of the geographic north-south shape of Israel—and attempting to reduce that to a 35mm color slide. When we photographed our ubiquitous 8.5" x 11" CIA map of Israel we had much better success; however, there are very few such sized maps for Israel. The issue here was not the failure of the Kodak Photo CD technology, but rather the innocence that we exhibited while riding on the edge of a new technology in that historic year of 1994!

Perhaps we should have learned to step back and let others experiment, but it wasn't long before we entertained further experimentation with this technology as it tantalized our minds with thoughts of improved access and mitigation of preservation concerns. Our discussions with a commercial firm, already working at Harvard on other scanning projects, led us to believe that we might have success if we chose a genre of materials smaller in size and a consistency of size would also make it more cost efficient. After some review, we created a selection of consistently sized materials that were less than 3' x 3' by choosing to photograph and scan sections of our early fire insurance map collection. After initial testing proved satisfactory, we decided to photograph about 2,500 images from several years and from different map publishers. Remember, this was also going to be a test on improved access and we needed a large image file which could be tested as a suitable substitute for paper files.

First, once again, let me remind you that this is not preserving the item but rather reformatting it. However, this reformatting hopefully will improve access to these materials, allowing the originals to be used far less, and that may be considered a "preservation" benefit to this process.

Let me stress that it is relatively easy and inexpensive to photograph and scan onto Kodak Photo CDs. What is far more difficult is to then provide bibliographical or descriptive access to, not only the titles on these CDs, but also the individual images themselves. Certain atlas titles, for example, included double-page maps, and it was decided to photograph each of these as two images, rather than one. Suddenly, the one page index at the front of each volume was no longer valid as it now had two individual images for each one in the original. As our technology increases, be forewarned that you will fall prey to another techno phobia: why can't we now index more information such as bridges, wharves, buildings, parks, etc. The problem is you can, and this is fine if you reformatted 10 or 12 maps, but not fine when you have done about 2,500 of them.

Additionally, you are faced with creating a separate database for searching these items, keying the index to an individual CD, then inserting the CD, and searching for Image #27 for

example. In other words, there is no magic software that allows you to query "Massachusetts State House" and in fifteen seconds the image showing the State House appears on your screen. In reality, you will have to create a database with all of the buildings you wish to search and then key them to "CD #" and then "Image" on that CD. This will become more complicated if you have 4 or 5 different images of the State House, on different CDs, representing different chronological dates, different publishers, and perhaps even different scales. To be perfectly honest, this is the stage where we find ourselves: attempting to decide which database will best satisfy our needs knowing that we will have multiple results to some of our searches and identifying a database that is expandable. The Kodak Photo CD technology provides you with five different resolutions ranging in computer file size from about 256 Kb to 18 Mb. Some computers may not even be able to work with this largest file of 18 Mb and it suffers from being relatively slow to load (an average of 45 seconds on a high end machine) and the entire image often cannot be viewed on one screen. Conversely, if someone wishes to concentrate on a particular segment of the map, requiring several zoom magnifications, this is the best size to work with. The intermediate file size, 4.5 MB, loads much more quickly, can be viewed entirely on one screen, and does allow considerable flexibility within the image.

For larger maps, and for serious research purposes, libraries may wish to consider the Kodak Pro Photo CD, where an additional sixth file size averaging 72 Mb has been added. Obviously, fewer maps can be placed on one CD but the resolution for detailed viewing offers considerable improvements. It should be added that this information is current as of April 1997 and we can expect considerable improvement in CD, software, and equipment technology in the next few years, if not in the next few months.

Let me state categorically that CD technology is not, and probably will not be, THE answer to our preservation or access problems. Perhaps it is appropriate to insert in our discussion the phrase: "at what price?" A Photo CD with about 100 images can be created for about \$100, to which should be added 35mm photography of the materials. Our intent was never to "discard or recycle" our original maps but rather to improve access to them and better preserve them through the planned less handling as mentioned earlier. We believe we can create a useful indexing database and then completely substitute the digital copies for reference and research rather than the originals, thereby mitigating our preservation concerns for these materials. Our access to these materials improves as students can produce color copies in the Map Collection in less than a few minutes. Moreover, imaging software allows the user to magnify their specific area of interest, albeit limited, better than the human eye can and far less expensively than photographic processes used in the past.

Therefore, we will accomplish our goals of improved access and preservation for this collection using CD digital technology. For considerably less than \$5,000 we have been able to take nearly 3,000 fragile materials out of circulation, away even from reference, and yet believe we will be able to improve access to them. Obviously, the benefits are on the access side and we will still have to address the preservation issues in the future. Our goal was to preserve materials for the future when we might be better able to address these issues. We were definitely fearful of losing many of these items due to the increased popularity of early fire insurance maps. It is hoped, over the next several years, to move more heavily used and fragile materials to this format for quick reference, ease of copying, and to decrease use of the original paper materials. Such materials will include additional

fire insurance maps, maps of the Boston region, maps of New England, and some of our urban maps of European cities which are heavily used by landscape architecture and planning students.

A quite different, and yet very related, project was created based upon the need of students and faculty. Essentially, that need was their use of the 1990 U.S. Federal Census. It was aging rapidly, and they required additional information that would be up-to-date. Even though very few of our students are from Massachusetts they are still using the state, and the City of Boston, as the laboratory for many of their studies which require socio-economic and environmental data.

Unlike the rest of the country where counties are the basis for most data dissemination, it is the town that is the collection dataset for most of New England. This was still not nearly as detailed as census tracts or block groups, but Massachusetts' 351 towns certainly provided a far greater geospatial variation than would its fourteen counties. We soon found ourselves collecting information on shopping centers, tax rates, employment, supplemental income, race, and ethnicity. It also soon became apparent that we were identifying data that were far more detailed than the decennial Census and data that would never be included in any decennial Census.

An Advisory Board, including a local geography professor and demographer, led us to believe that we should publish an atlas for the State of Massachusetts. Further discussions led us to realize the folly of such a proposition. We knew that it would become a static collection of information the moment it was published and the very data itself revealed the dynamics of the changing economy, society's transitions, and the increasing challenges to our environment.

It soon became apparent that we should consider what had been in front of us the whole time: the World Wide Web. There were other atlases on the Web which we studied, reviewed, and then created a list of our own needs:

- Work interactively rather than just providing images;
- Expandable;
- Work with current Internet provider software packages;
- Provide zoom features;
- Provide geographic data features: scale, legend, and radial mapping;
- Provide graphic images, data behind them, and metadata files, and
- Allow users easy access and self-explanatory use – a REAL challenge!

We are fortunate to have a cooperative working relationship with the Environmental Research Systems Institute, Inc. (ERSI) through the ARL GIS Literacy Project and with its Boston regional office. Discussions soon began as to how we might address our needs and

goals related to the collection, cataloging, and dissemination of digital data and progressed from considering ARC-INFO, to Map Objects, and eventually to the Arc View Internet Explorer. ERSI's cooperation was invaluable to this project and their time investment and expertise allowed us to progress to our defined goals and objectives.

A cooperative resource sharing relationship with one of Massachusetts' planning organizations, the Metropolitan Area Planning Council, led to discussions with the Massachusetts Regional Planning Associations. Their support and financial assistance moved the project forward and led us to concentrate our efforts in the following categories: geographic boundaries; communications; crime; education; employment; environmental regulation; income; physical characteristics; population; race/ethnicity; real estate/lodging; and transportation.

The atlas debuted on January 10, 1997 as one of the first interactive state atlases with 150 different data layers. The user interface continues to be reviewed, revised, and hopefully improved. The limitations of one screen "to inform everyone about everything" is challenging and yet it should be realized that most people will probably not read your instructions on "How to Use the Atlas." The challenge is to address GIS issues in a non-jargon language that will be understood by a variety of users who are essentially unfamiliar with the techniques or principles of GIS. We assume that our users will range from the state official or business planner with some GIS experience, to the middle school student who may just happen upon the Atlas on the Internet. It is important that we not affront the intelligence of the practitioner nor make it so difficult for the uninitiated to use it.

Such a project has several implications regarding service and data interests.

### **Emphasize State & Local Data vs. Federal Data**

Regardless of what may happen with Census 2000, libraries will always be faced with the issue of updating the decennial census as researchers continue to demand, and expect, more up-to-date data and geography. If the data collection for Census 2000 should be decreased, this would place an even greater emphasis and dependence upon state and local data for planning and research purposes. Our past practices in libraries have not given this data its proper credit and we may find ourselves more dependent upon it than ever before.

### **New Partnerships with Data Creators**

As libraries become more familiar with GIS technology and data management techniques, we will become "players" in the digital field of GIS access and will be able to exhibit our strength of adding service. It is very probable that libraries will now be invited to sit and discuss access and service issues with the data creators and form a profitable cooperative relationship.

### **Creates a 'Library Without Walls'**

Implications are positive for the digital library as we allow more users to enter this library than ever before. It is not dependent upon discipline, and it is theoretically open twenty-four

hours a day and 365 days a year. The negative side is that we may no longer know our users nor are we able to provide the reference interview that can be so important to providing the appropriate material for the question.

### **Attracts Users Who Would Never Use the Library**

While it is difficult to monitor currently, it is apparent that a wider variety of users is attracted to digital data and its applications than was previously attracted to traditional print resources. It is also important to note that interest in the print collections is rising in a similar geometric pattern as persons may initially approach the library with a digital question and leave with a traditional map copy.

### **Marketing/PR of GIS Services**

Libraries that are able to move from the traditional print world into the digital world, and back and forth, have a tremendous marketing/PR potential. They have the ability to boast of their traditional collections and yet let their users and the library administration know that they have not become a paper museum. They have chosen to participate in the new digital technology, and maps are one of the most powerful tools in this arena.

### **Rethinking Archival Responsibilities**

As we begin to collect (and save?) digital data, it becomes evident that we must give some consideration to archival responsibilities. If we choose to display a map of welfare recipients in 1996 what choices should we make when the 1998 data arrives – do we simply delete the "old" data? Often, as libraries are well aware, it is the historical data that are far more valuable than current information.

### **Emphasis on Data**

A GIS database emphasizes data, not maps, and that will be a potentially significant change for map libraries as they evolve into the next millennium. Not only will this change our current thought process but it may place libraries in conflict with other departments and disciplines that have considered data their discipline. It is important that we work with others in the library, and outside, to convince them of the critical importance of GIS as an analytical tool and how data dependent the technology is. We must also look at data as an access versus ownership issue, and that is a library philosophy that will continue to be discussed well into the future.